



Agricultural Research Institute, Pusa

Agricultural Implements and Machinery at Pusa  
Part IV

Power Implements and Machinery

BY

G. S. HENDERSON, N.D.A., N.D.D.

*Imperial Agriculturist, Pusa*

AND

ARJUN SINGH, L.Ag

*Assistant to the Imperial Agriculturist, Pusa*



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# AGRICULTURAL IMPLEMENTS AND MACHINERY AT PUSA, PART IV.

## POWER IMPLEMENTS AND MACHINERY.

*(Received for publication on 26th November 1928.)*

Pusa is very advantageously situated for working tests with power machinery. The following are the chief branches which have been studied at this Institute :—

- (a) Steam Cultivating Tackle (Fowler's Double Engine).
- (b) Motor Tractors.
- (c) Centrifugal Pumps.
- (d) Farm Steading Machinery.

### (a) Steam Cultivating Tackle.

(Plates I—V.)

The set consists of Fowler's class K, 2 Compound Single Cylinder 8 N. H. P. Steam Engines, each with a cable drum having 450 yards steel wire rope. An anti-balance plough No. 11152, one spring tine cultivator No. 10672, a two-shaft concave disc harrow No. 11525 and double Crosskill rollers.

It was introduced at Pusa in the cold weather of 1913, the object being to study the economies of steam cultivation for large estates in India and to deal with the labour difficulties which arise in the carrying out of intensive cultivation of a large area.

Results of the working of this set for ten years are as follows :—

COST OF VARIOUS OPERATIONS WITH FLOWER'S STEAM TACKLE FOR 10 YEARS.

Year	Labour		Fuel	OH	Renewal of implements and stores	PLOUGHING			GREETING			DISC HARROWING			ROLLING			Total working days
	Rs.	Rs.	Rs.	Rs.		Total work done	Cost per acre	Rs.	Total work done	Cost per acre	Rs.	Total work done	Cost per acre	Rs.	Total work done	Cost per acre	Rs.	
1917-18	940	1,424	315	3,410	6,096	170	7	9	616	26	4	821	20	3	173	22	4	121
1918-19	534	1,053	482	1,094	4,136	373	8	4	605	21	1	606	17	2	540	21	1	145
1919-20	1,200	1,923	623	1,196	4,652	465	8	5	488	22	2	582	21	2	533	23	2	129
1920-21	1,450	2,140	588	1,764	5,942	445	8	6	480	22	2	683	18	3	386	25	2	131
1921-22	1,243	1,622	412	1,783	5,660	242	8	6	601	21	2	442	17	3	225	21	2	114
1922-23	1,278	1,494	483	2,137	5,362	373	8	6	507	21	2	470	17	3	334	23	2	112
1923-24	1,317	1,819	486	611	4,233	374	7	5	494	20	2	535	14	2	128	24	1	120
1924-25	974	1,498	410	1,048	3,930	359	10	5	320	18	2	324	14	3	160	20	2	87
1925-26	1,368	1,781	350	3,502	7,031	394	8	4	238	24	3	512	20	3	530	26	3	108
1926-27	1,152	11,480	217	1,643	4,527	438	10	5	208	25	2	513	18	3	410	27	2	98
Es.	11,856	16,517	4,890	18,202	50,971	3,573	82	59	4,620	220	23	5,438	176	27	3,465	232	21	1,157
Average Rs.	1,186	1,652	440	1,820	5,097	357	8	5	462	22	2	544	18	3	349	23	2	116

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No depreciation or interest have been taken in working out these columns, but spare parts as required have been bought and charged for. The set is in excellent conditions and seems good for many years' work still.

The original costs were as follows :—

	Rs.
Engines with steam cables . . . . .	30,000
Disc plough and gang plough . . . . .	5,750
Disc harrow . . . . .	5,020
Grubber . . . . .	3,227
Zigzag harrow . . . . .	2,250
Roller . . . . .	670

There is no difficulty in keeping the set up to concert pitch by means of local labour. The steam engine with its large factor of safety is a much sounder practical proposition than a high speed motor tractor which requires continual repairs and expert attention. The implements worked with this set are shown in the illustrations. The whole of the farm area is deeply ploughed, over 10", once in the year.

#### (b) Motor Tractors.

(Plates VI, VII and VIII.)

The motor tractors at Pusa are chiefly used for secondary work such as cultivating and disc harrowing. They are also employed to a certain extent for belt work. The following statements show the actual life of three makes of standard motors as they are now practically worn out. Results show that their working is very expensive owing to the heavy depreciation. Great difficulty has always been experienced in getting spare parts in India. Much delay and damage has been caused and the machines have had to be laid up frequently during busy times. Other tractors are still on trial of which the International Harvesting Company's 15-30 H. P. size seems to be very promising. The price is Rs. 4,850; the agents are Messrs. Macbeth Bros., Bombay. (Plate VI.)



STATEMENT SHOWING THE CONSUMPTION OF FUEL, LUBRICATING OIL, ETC., IN DIFFERENT MOTOR TRACTORS USED ON THE PUSA FARM FROM THEIR DATE OF PURCHASE TO THE END OF 1927

Name of Tractor	Kind of work done	Total number of hours worked	KEROSENE OIL		PETROL		LUBRICATING OIL		GREASE	WASTE	Total cost of spare parts.
			Total consumed	Per hour	Total consumed	Per hour	Total consumed	Per hour	Total		
										Gallons	
Fordson 1913-27	Cultivation	1,726	2,851	1.6	87	0.05	37.5	.21	70	40	2,058
	Belt pulley	502	417	0.8	60	0.12	93	.18	10	3	
Austin 1920-27	Cultivation	2,207	2,876	1.3	130	0.06	376	.17	82	50	2,476
	Belt pulley	816	585	0.7	85	0.10	76	.09	39	20	
Chitrac 1921-27	Cultivation	1,246	2,006	1.6	115	0.09	436	.27	230	44	4,029

STATEMENT SHOWING SUMMARY OF WORK DONE BY THE DIFFERENT TRACTORS USED ON THE PUSA FARM FROM

STATEMENT SHOWING SUMMARY OF WORK DONE BY THE DIFFERENT TRACTORS USED ON THE PUSA FARM FROM THEIR DATE OF PURCHASE TO THE END OF 1927

Name of Tractor	PLOUGHING			DISC-HARROWING			GRUBBING			ROLLING			REAPING			DRILLING			THRESHING		
	Hrs.	Acres	Acres per hour	Hrs.	Acres	Acres per hour	Hrs.	Acres	Acres per hour	Hrs.	Acres	Acres per hour	Hrs.	Acres	Acres per hour	Hrs.	Acres	Acres per hour	Hrs.	Acres	Acres per hour
Fordson	4 30	226	0.25	422	594	1.29	112	5.5	1.51	107	139	1.40	83	84	1.01	2	1				
Austin	224	316	0.16	1,905	1,296	1.28	7.25	1.36	1.41	64	92	1.47	108	162	1.31	3	1		22	21	
Clarence	168	107	0.62	730	8.7	1.22	583	5.6	1.18	112	165	1.46	51	51	1.21				2	4	0.2

The implements used with the above machines are :—

Mould Board Plough	Oliver No. 7	2 furrow self lift.
Mould Board Plough	Ransomes' R. S. L. D.	2 furrow self lift.
Mould Board Plough	Ransomes' R. S. L. D.	3 furrow self lift.
Disc Plough	Oliver D. 43A.	3 furrow self lift.
Disc Plough	Oliver D. 42.	2 furrow self lift.
Cultivator	Ransomes' Orwell K. S. L., 11 lines. (Plate VIII, fig. 2.)	8 ft. 3 in. wide.
Disc Harrow	Roderic Lean. (Plate VIII, fig. 1.)	28 discs.

The 2-furrow ploughs were used with the Fordson and Austin Tractors and 3-furrows with Cletrac.

Among the ploughs, none have been found satisfactory. The Cultivator and Disc Harrow have been considered the most suitable implements for Pusa conditions.

### (c) Centrifugal Pumps.

Any of the standard makes give satisfactory work especially when driven by a portable steam engine. In pumping from a river it is better to allow plenty of size in order to get all irrigation performed during day-light. One hundred and thirty acres are under irrigation here and are provided with a ten inch and an eight inch pump. Care should be taken to get low lift type pumps when the static head is under 30 ft.

### POWER UNITS.

For general agricultural purposes there is nothing to beat Portable Steam Engines. They are almost fool-proof, simple to understand and easy to repair. A set suitable for general agricultural purposes is Ransomes, Sims & Jefferies' Single Cylinder Portable engine No. 8, 8 N. H. P., 10" cylinder, 12" stroke, working at 150 revolutions per minute, and when new, the steam pressure will be 120 lb., per square inch. Price, Rs. 5,000 (Plate IX).

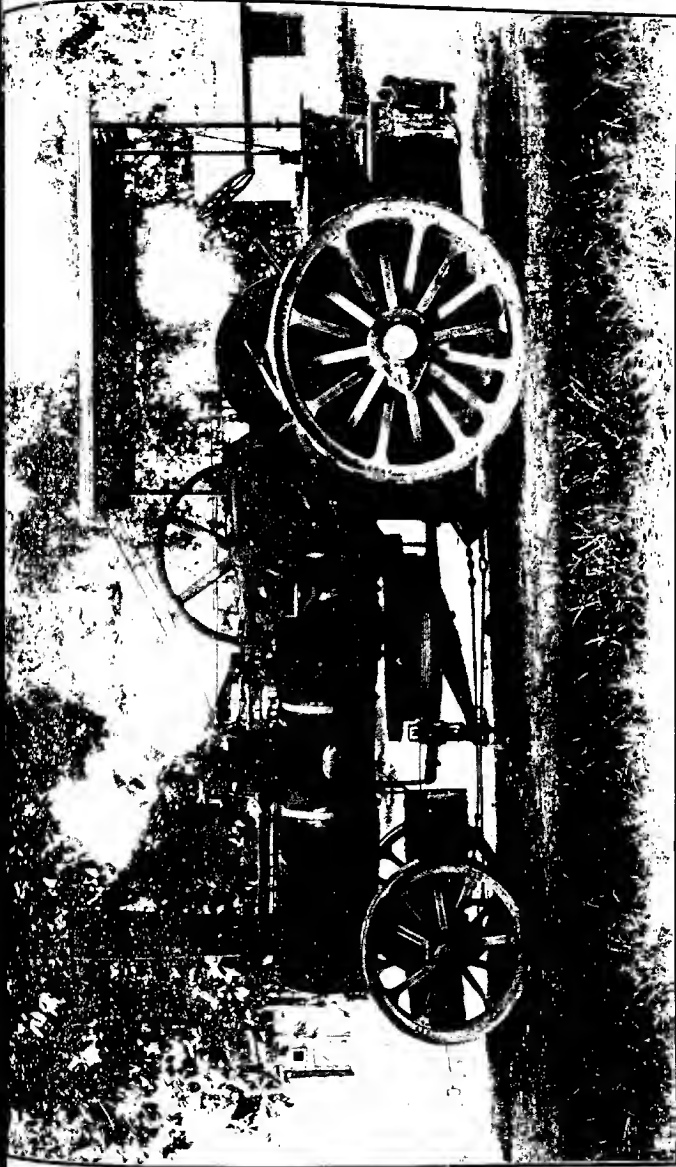
### (d) Farm Steading Machinery.

It is useful to have an oil or other engine and a driving range of shafting at the farm steading. This can be used for grinding and chaff-cutting and also to drive workshop machinery. Where there is much

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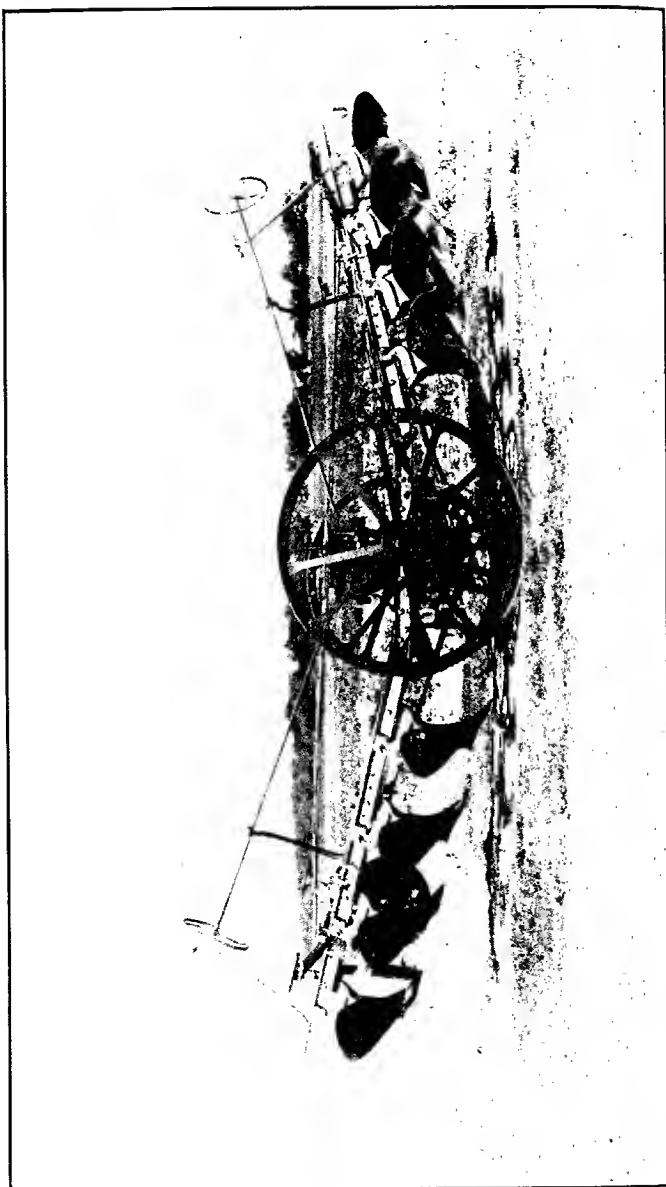
power machinery, a small workshop is essential. The workshop should be provided with a small lathe, a drilling machine and a grinder. A small circular saw is useful and a band-saw is a great economy for all classes of wood work. A small shop of this nature and having a blacksmith or two can deal with most classes of running repairs and should also be able to turn out small brass castings which are constantly in demand.





FOWLER'S STEAM PLOUGHING ENGINE

PLATE II.



PLUGH FOR STEAM TRACTOR

PLOUGH FOR STEAM TACKLE

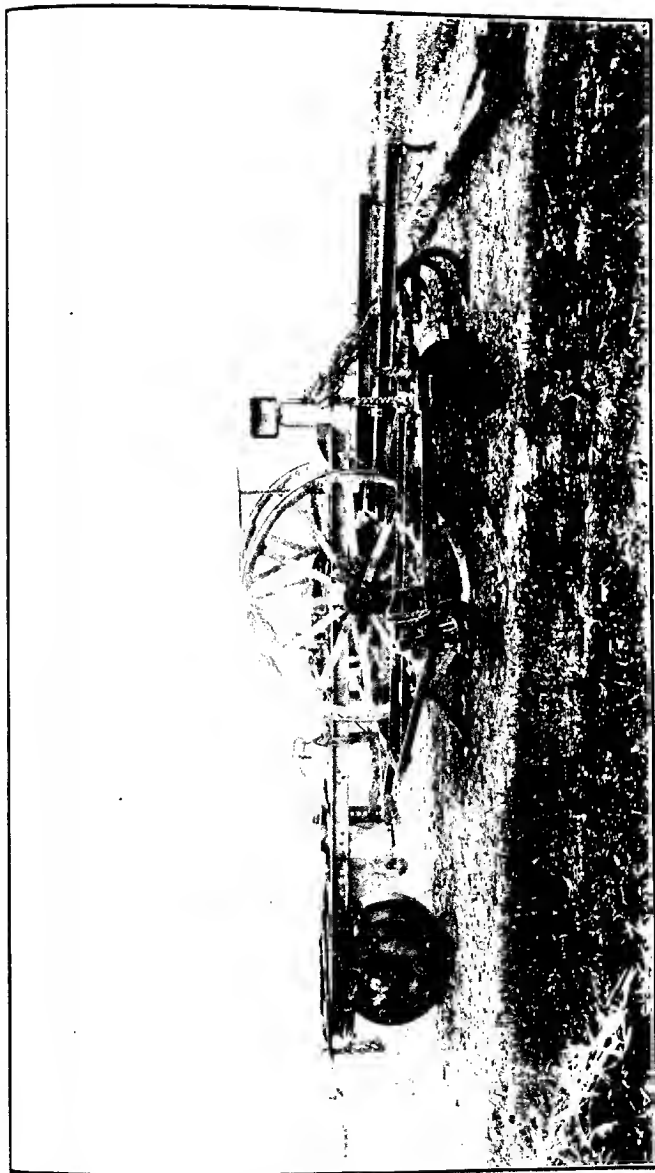
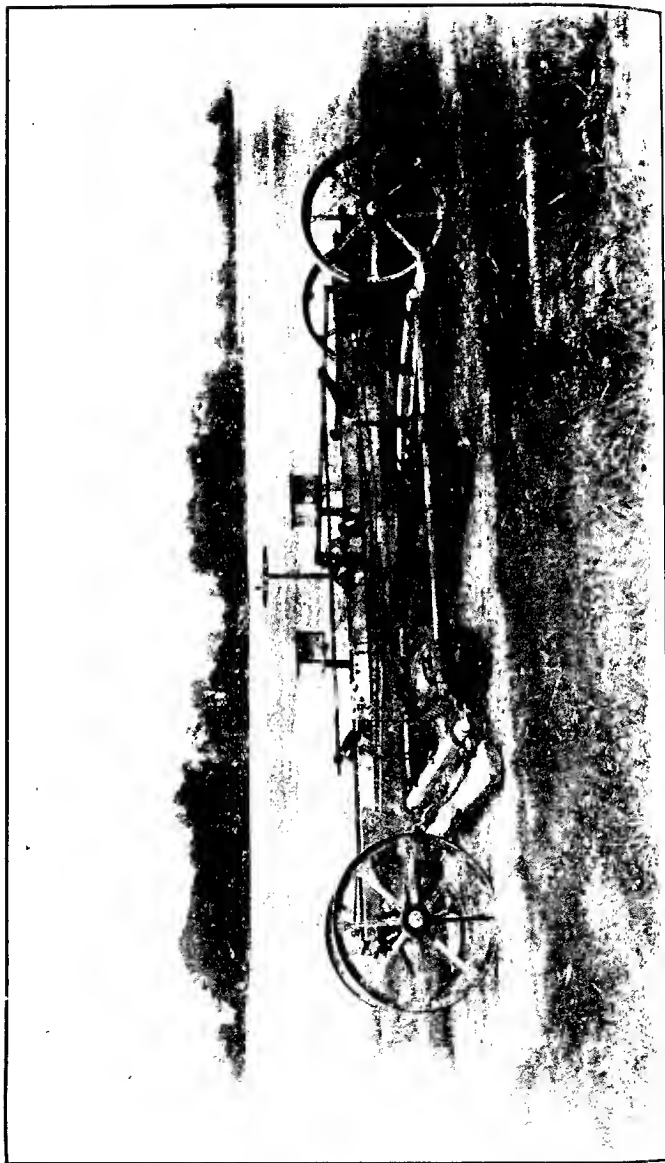


PLATE III.

CULTIVATOR FOR STEAM TACKLE



PLATE IV.

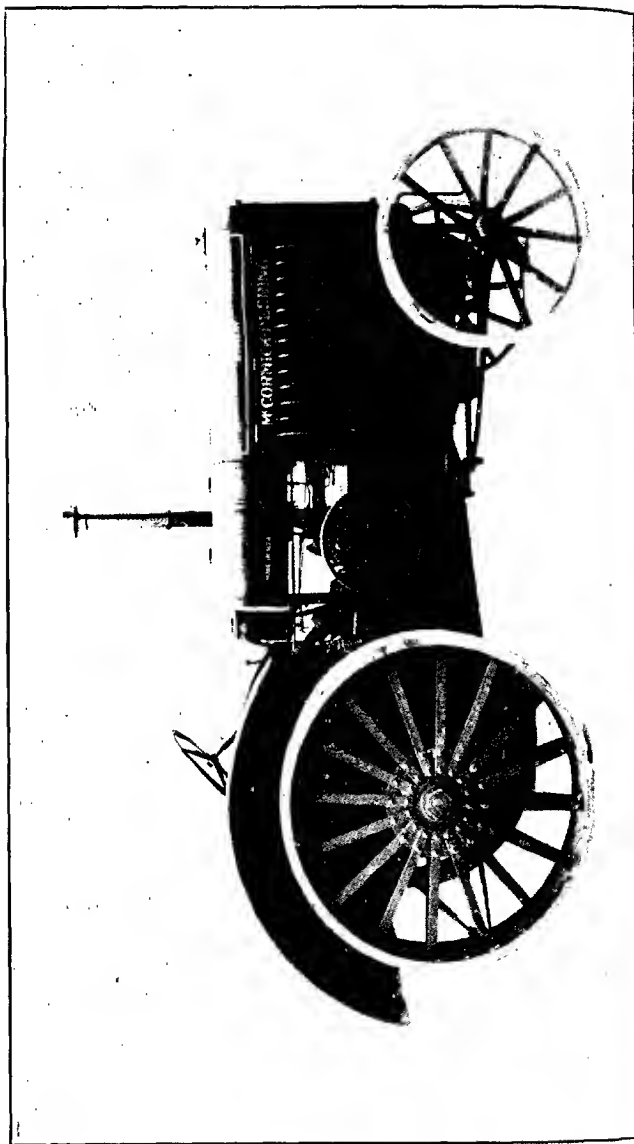


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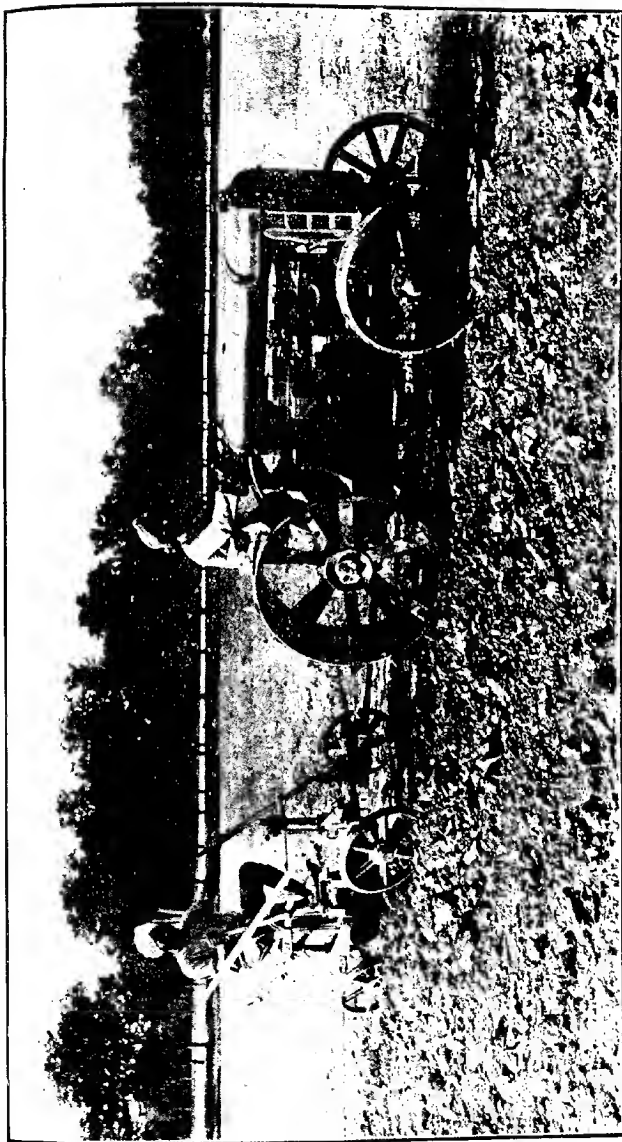


ROLLER FOR STEAM TACKLE.

PLATE VI.



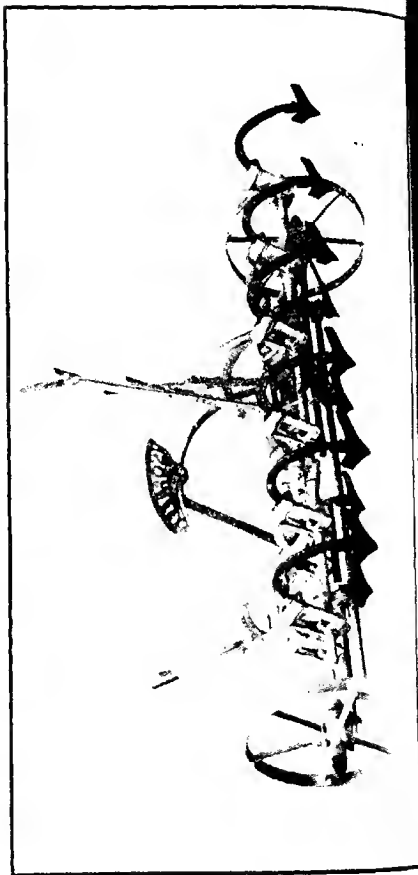
MCCORMICK FARMING TRACTOR

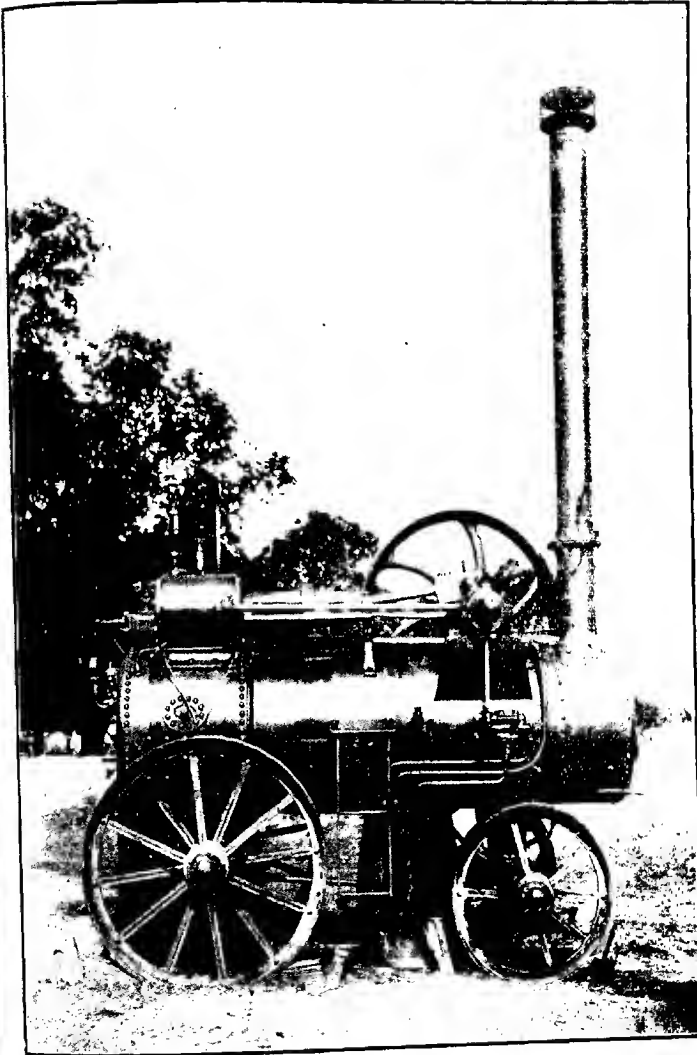


FORDSON TRACTOR AND DISC PLOUGH.



FIG. 1. Podern Lean Disc Harrow.





PORTABLE STEAM ENGINE.

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